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Economic downturns during the life-course and late-life health: An analysis of 11 European countries

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Abstract

Background: Research has shown that individual socio-economic circumstances throughout life affect health in older ages. However, little attention has been paid to the broad economic context affecting individual's life-chances. This paper examines whether economic downturns experienced during young and mid-adulthood have long-run effects on physical health.

Methods: We exploit data on economic fluctuations in the period 1945-2010 in 11 European countries, linked to longitudinal data from the Survey of Health, Ageing and Retirement in Europe (SHARE). We estimate a country fixed effect model assessing whether downturns experienced at 5-year intervals between ages 25 and 54 are associated with levels and onset of new limitations with Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) in older age (55-80).

Results: Experiencing an downturn at ages 45-59 is associated with increased risk of having at least one disability limitation in later-life (Odds ratio[OR] for ADL=1.66, 95% CI [Confidence Interval] 1.24, 2.22; OR for IADL=1.46, 95% CI 1.10, 1.94). Downturns at ages 40-44 and 45-49 also increase the risk of a new functional limitation in later-life (OR for IADL ages 40-44=1.20, 95% CI 1.03, 1.40; OR for IADL ages 45-49=1.44, CI 1.10-1.88). Downturns experienced around these ages are also associated with significantly greater risks of smoking and excessive alcohol consumption as well as lower incomes in older age.

Conclusions: Exposure to an economic downturn at ages 40-49 is associated with poorer health in older ages, possibly by increasing risk of unhealthy behaviours and low incomes persisting into older age.

Keywords

Disability, Recession, Economic Downturn, Macroeconomic, Europe, Social Determinants of Health

Introduction

Research suggests that social and economic circumstances during childhood[1, 2] and adulthood,[3, 4] including job loss and job insecurity[5, 6], are associated with poorer health in later-life. In many studies, however, it is difficult to establish causality between individual health and economic circumstances, or whether an association arises due to unmeasured confounding.[2, 7] Recent studies, therefore, have considered how economic context, which shapes individual labour market and socioeconomic opportunities, influences health in the long-run.[8, 9 10] An advantage of this approach is that changes in economic context, such as onset of an economic recession, cannot be 'caused' by individual health and are therefore not susceptible to reverse causality. For example, evidence suggests that women experiencing a downturn around year of graduation have poorer health in older age compared to women who graduated during an economic boom.[8, 9] Likewise, economic downturns during mid-life have been found to be associated with poorer cognitive function in older men and women,[10] whereas recessions around retirement increase subsequent mortality.[11]

So far, no studies have assessed whether exposure to adverse macroeconomic conditions during early and late mid-adulthood have long-lasting effects on physical health. The period of early adulthood may be particularly sensitive to changing economic conditions as it coincides with critical life-course events such as entering the labour force, leaving the parental home, establishing an own residence, forming a family and transiting into parenthood. Middle-age workers may be particularly vulnerable to a poor economy as they may face difficulties in

returning to the labour market after job loss, and at the same time they may be too young to retire.

This study addresses this gap by examining how life-time experiences of economic downturns across several life-course stages influence functional health in later-life. Linking data on macroeconomic cycles between 1945-2010 to longitudinal data for 11 countries in the Survey of Health, Ageing and Retirement in Europe (SHARE), we examine whether economic downturns experienced at each 5-year interval between ages 25 and 54 are associated with physical functioning in later-life (ages 55 to 80). We also explore several potential behavioural and socioeconomic mechanisms linking macroeconomic conditions to late-life physical health.

Methods

Individual data

SHARE is a longitudinal survey designed to provide comparable information on health, employment and social conditions of Europeans aged 50+ in 13 European countries. Detailed information about the methodology is available elsewhere.[12, 13] Participants were interviewed in 2004/5 (wave 1) and subsequently re-interviewed in 2006/07 (wave 2) and 2008/09 (wave 3). Wave 3 included a detailed retrospective life-history questionnaire (SHARELIFE). Except for Austria and Dutch-speaking Belgium, the second wave in 2006/07 also included a refreshment

sample. Baseline response rate was 62% on average, but it varied from 37% in Switzerland to 73% in France; retention rates ranged from 65% to over 70%.[14, 15]

Our analytical sample included respondents who participated in at least one (baseline) interview (either in waves 1 or 2) and subsequently participate in the SHARELIFE interview. Outcomes corresponded to baseline health measures, or onset of new physical limitations between baseline and follow-up. Czech Republic and Poland were excluded due to lack of comparable data on GDP before 1990;while Ireland and Israel were excluded because they did not participate in the life history interview. The main sample included 20,780 participants in 11 Western European countries. We restricted the sample to participants aged 55 to 80 years at study entry and born between 1930 and 1956 (N=14,754), excluding individuals with missing information on relevant health outcomes, childhood-health, socio-economic conditions or sampling weights. The final sample included 13,514 individuals.

SHARE assessments

Our measure of functional health was based on two scales of physical functioning: (a) the Katz Activities of Daily Living (ADL) scale,[16] a commonly used measure that asks individuals to report whether they experience any difficulties with six basic self-care tasks (bathing, dressing, toileting, transferring, continence, and eating);[17] and (b) the index of Instrumental Activities of Daily Living (IADL), which asses difficulties with more advanced activities (using a map, preparing hot meals, shopping, telephone use, taking medications, housekeeping tasks, and

managing money)[18]. Higher ADL or IADL scores are strongly predictive of poorer health and higher mortality.[19]

Models include controls for sex, country and year of birth fixed effects. We also included age-splines (ages 55-59, 60-69 and 70-80) to allow for non-linearities in the relationship between age and limitations, but other specifications (e.g., linear or quadratic) led to essentially identical results. We also control for childhood socio-economic status using two measures: (a) education (primary, secondary or post-secondary); (b) occupation of main breadwinner at age ten, collapsed into two major categories of the International Standard Classification of Occupations (ISCO): 'blue collar' and 'white collar' workers; and (c) physical features of childhood home at age ten (fixed bath, cold running water supply, hot running water supply, inside toilet, central heating), indicating if the house had none, 1-3 or 4-5 of those features. We also incorporate two measures of childhood health in our analysis: (a) self-reported diagnosis of major childhood-illnesses, reclassified into two binary indicators capturing whether respondents suffered any major infectious or non-communicable condition as a child; and (b) physical health conditions indicating if a respondent suffered from broken bones or fractures during childhood. The choice of control variables was motivated by the circumstance that they are determined before exposure of interest starts (age 25). Controlling additional characteristics in adulthood, such as labour force status or income, would risk conditioning on potential mediators and hence block causal pathways.

To explore potential mechanisms we incorporated measures of health behaviours including current smoking, excessive alcohol consumption (drinking alcohol almost every or 5/6 days a week) and physical inactivity (hardly ever or never engaging in vigorous physical activity). In addition, we explored the impact of downturns on household income (measured as country-specific quartiles), labour force participation as well as respondents' self-reports of whether they believe health will limit their ability to work until regular retirement.

Data on economic cycles

We use historical time-series on annual gross domestic product (GDP) per capita obtained from 'The World Economy: A Millennial Perspective' database up to 2010.[20-22] To derive information on individual exposure to downturns over the life-course we separated the cyclical component from secular trends in log of GDP for each country using the Hodrick-Prescott filter[23] with a smoothing parameter of 100. We then followed a common approach in the literature by converting the cyclical component into country-specific quintiles.[24-26] For each country, an annual deviation from the trend in GDP per capita that fell in the lowest quintile was classified as a downturn.[24-26] This approach enabled us to distinguish years of economic up- and downturns within each country.[10, 25, 27] In supplementary analysis, we found that using absolute number of downturns instead if this binary indicator for each age interval yielded very similar results. Appendix Table 1 shows country-specific cut-offs in terms of deviations from the trend from GDP per capita used to define a downturn.

We used yearly information on life-time exposure to business cycles to create a set of variables indicating whether an individual had experienced at least one downturn during each 5-year age-interval from ages 25 to 55 years.[10] Because we focus on effects of downturns during mid- and late-adulthood, we chose age 54 as upper limit as years beyond this age often coincide with transitions to retirement.

Statistical analysis

We used logistic regression to model probability of reporting one or more limitations with ADL and IADL. To control for constant differences across countries and cohorts that could bias estimates, we estimated country- and birth year-fixed effect models exploiting within-country variation across cohorts. The basic model had the following form:

$$\log\left[\frac{P(Y_{ijt}=1)}{1-P(Y_{ijt}=1)}\right] = \beta_o + \beta_1 X_i + \beta_2 D_{ja} + \beta_3 C_j + \beta_4 B_t$$

Where Y_{ijt} is probability of having at least one limitation in ADL or IADL for individual *i* born in country *j* in year *t*; β_o is the intercept, X_i is a vector of individual-level controls, D_{jta} is a vector of indicators for the occurrence of a downturn in age interval *a* for country *j*. The country-fixed effect C_j controls for all unmeasured differences across countries such as institutional characteristics, economic development and health. The year of birth fixed-effect B_t controls for all unmeasured differences across birth-cohorts. Finally, We also exploit the longitudinal data to

assess whether downturns at ages 25-54 were related to risk of a new limitation in ADL or IADL between wave 1 and 2.

Our sample combines individuals interviewed for the first time in 2004/05 (≈75% of the sample) or 2006/07 (≈25%). Having first-time respondents interviewed in these two waves means that we observe individuals from the same country and age who experienced different stages of business cycle at different points of the life-course. This is an improvement over an approach based only on a cross-sectional sample since number of downturns experienced at different ages is not fully determined by year of birth. Regression estimates were exponentiated to obtain odds ratios (OR).

We found no significant interactions between gender and downturn indicators; we therefore present results for the pooled sample. All analyses were conducted using calibrated sampling weights to account for bias due to unit nonresponse and sample attrition.[28] Standard errors were clustered at the country level.

Results

Sample characteristics are shown in Appendix Table 2. About 6.5% of respondents reported at least one limitation in ADL and 11.2% at least one limitation in IADL. Mean age was 65 years with cohorts born between 1924 and 1951.

Downturns at ages 25-55 and functional health at ages 55-80

Figure 1 shows predicted probabilities of reporting one or more limitations in ADL and IADL at age 55-80 according to experiencing downturns at subsequent age-intervals between ages 25-54, obtained from models that control for sex, age and country of birth. Individuals experiencing at least one downturn at ages 45-49 or 50-54 had a significantly greater probability of reporting limitations in ADL or IADL at ages 55-80. For example, individuals experiencing a downturn at ages 45-49 had a 8.2% (95%CI=7.6, 8.8) risk of reporting at least one limitation in ADL at ages 55-80, compared to 5% (95%CI=4.0, 6.3) for those suffering no downturn in the same age bracket. Downturns prior to age 45 were not associated with functional limitations in later-life.

Table 1 shows odds ratios from logistic models regressing the binary indicator of reporting one or more limitations in ADL and IADL at ages 55-80 on a set of indicators of downturns experienced at consecutive 5-year age-intervals between 25-55, controlling for early-life health and socio-economic conditions, education, country and year of birth. Experiencing a downturn at ages 45-49 was associated with significantly increased risk of ADL (OR=1.66, 95%CI=1.24-2.22) and IADL (OR=1.46, 95%CI=1.10-1.94). The p-value of 0.001 associated with downturns

at ages 45-49 is below the critical value suggested by Bonferroni correction for multiple hypotheses testing (0.05/12=0.004). Results also show that downturns experienced at ages 50-54 are associated with higher risk of reporting limitations in ADL at ages 55-80 (OR=1.29, 95%CI=0.99-1.67), although the estimate does not reach statistical significance at conventional levels. Downturns experienced prior to age 45 were not significantly associated with functional limitations at ages 55-80.

Table 2 shows results of logistic models assessing whether downturns at ages 25-54 were associated with onset of new functional limitations between baseline and follow-up at ages 55-80. Downturns at ages 25-29 were associated with increased risk of experiencing a new limitation in ADL (OR=1.46, 95%CI=1.17-1.83) between baseline and follow-up. Downturns at ages 40-44 (OR=1.20, 95%CI=1.03-1.40) and at ages 45-49 (OR=1.44, 95%CI=1.10-1.88) increased risk of onset of new limitations in IADL.

Downturns at ages 25-55, health behaviours and socioeconomic outcomes at ages 55-80

Table 3 (Panel A) shows results for effects of downturns at ages 20-55 on current smoking, physical activity and alcohol consumption. Downturns experienced at ages 45-49 were associated with increased odds of smoking at ages 55-80 (OR=1.21, 95%CI=1.06-1.38, P<0.00). Supplementary analyses suggest that downturns around ages 40-54 significantly reduce likelihood of having quit smoking (among those who ever smoked) (Appendix Table 3).

We did not find evidence that recessions at specific age-intervals between ages 25-54 had a significant effect on likelihood of initiating smoking.

Economic downturns at ages 40-44 (OR=1.25, 95%CI=1.04-1.49, P=0.02) and 45-49 (OR=1.25, 95%CI=1.06-1.49, P=0.01) were also associated with higher odds of excessive alcohol consumption at ages 55-80. By contrast, downturns experienced at ages 50-54 were associated with lower odds of being physically inactive (OR=0.77, 95%CI=0.66-0.90, P<0.00), while downturns at ages 50-54 were associated with lower odds of excessive alcohol consumption (OR=0.86, 95%CI=0.77-0.97, P=0.01).

Table 3 (Panel B) shows that downturns at ages 45-49 were associated with decreased probabilities of being in a higher income quartile at ages 55-80 (OR=0.94, 95%CI=0.88-1.00). Downturns at ages 50-54 were associated with increased probability of being employed (OR=1.61, 95%CI=1.13-2.28). Downturns at ages 30-34 and 35-39 were associated with significantly lower probabilities of reporting that health limits ability to work until retirement, whereas downturns at ages 45-49 were associated with a higher probability of reporting that health limits ability to work until retirement (OR=1.81, 95%CI=1.13-2.90).

Discussion

Summary

Based on representative data for 11 European countries, we showed that downturns at ages 45 to 49 are associated with increased risk of physical functioning limitations at ages 55 to 80. Results were consistent for prevalence of chronic disease as well as incidence of new limitations. Our findings support the hypothesis that downturns during late mid-adulthood (45 to 54) are associated with poorer health in later-life, possibly through increased risks of unhealthy behaviours and reduced incomes.

Limitations

Despite several strengths, some limitations should be considered. A concern is non-response and sample attrition bias. We conducted analyses using calibrated sampling weights that account for nonresponse, attrition and mortality between waves.[28] Nonetheless, premature mortality associated with exposure to downturns before ages 55-80 is a potential concern. Although we have no direct way to account for this, in sensitivity analyses, we found that estimates for respondents aged 55-64 years, a group less susceptible to premature mortality, showed a very similar pattern as for respondents 55 to 80 (Appendix Table 4).

Our empirical approach does not enable us to fully separate cohort from period effects. However, sensitivity analyses show that the key findings are not driven by particular cohorts

(Appendix Table 5 and Figure 1). Whereas downturns may have different effects for individuals retaining their jobs compared to those experiencing unemployment, in supplementary analyses we found that controlling for experiences of non-employment or job-loss yielded very similar estimates (Appendix 6). In addition, our estimates relied on country-level data on GDP, as we lacked information on economic indicators for smaller regions, which may have concealed important regional variations within countries.

Finally, we used a non-parametric approach to identify economic downturns, which was based on quartiles of deviations from country-specific GDP trends.[25, 27, 29]. Caveat of this approach is that it does not distinguish downturns from different intensity, e.g, a downturn may be a year of small economic growth in one country, while it may refer to negative growth in another country. This approach was necessary to maintain some level of comparability over time and across countries. However, our estimates should be interpreted as reflecting the impact of an economic downturn relative to the economic performance of each country, rather than the absolute effect of exposure to severe economic recessions.

Explanation of results

Our findings are in agreement with studies suggesting that individual factors associated with economic downturns, particularly job loss and job insecurity, are associated with poor health outcomes in later life.[5, 30-32] Yet, our results might also reflect the influence of downturns via mechanisms other than unemployment, such as smoking and alcohol consumption.

Studies suggest that adverse financial circumstances and job loss can decrease resources for healthy behaviours such as exercise and nutrition, and may trigger use of alcohol or drugs as a coping mechanism to face adversity.[32, 33] In contrast, some studies suggest that economic downturns may lead to positive changes in health-related behaviour by temporarily reducing obesity, smoking and physical inactivity,[34] and reducing job-related stress.[33] Our results suggest that temporary improvements in health behaviours during downturns may be offset by cumulative detrimental effects of downturns.

Downturns may influence health through their impact on life-time earnings and financial assets. A macroeconomic shock experienced at middle-ages may lead to substantial drops in housing wealth, influencing life-time accumulation of financial resources to finance consumption and maintain living standards in older age.[35, 36] Over the long-run, reduced earnings and wealth may trigger several mechanisms potentially harmful to health,[7, 37, 38] contributing to poorer disability outcomes for cohorts that experienced less favourable economic conditions during their adult life.

We found that individuals aged 45 to 49, and possibly 50 to 54, may be particularly vulnerable to downturns. Evidence from the recent recession shows that consequences of job-loss were particularly severe for workers in their 50's[5, 6] Job loss among older workers is associated with increased risk of cardiovascular disease,[6, 39] alcohol consumption,[40] depressive symptoms[41] and physical disability,[42] all of which may lead to long-term loss of physical function in older age. Many individuals aged 45 to 54 also belong to the so-called 'sandwich generation',[43] a group

that faces the competing pressures of simultaneously caring for children and older family members. A period of economic adversity may thus have particularly stressful consequences for these individuals, which may in turn translate into poorer health in older age.

Conclusions

Results from our study suggest that years in recession at ages 45 to 49, and possibly at ages 50 to 54, are associated with poorer health in older age. It is tempting to conclude, based on our findings, that government policies that typically slowdown economic growth, such as environmental regulation, would have negative consequence for health, i.e., because they may expose cohorts to more economic downturns. We believe such inferences are not justified based on our findings, because many of these policies might have their own direct effects on health. Assuming that economic downturns cannot be entirely avoided, our results do suggest that policies aimed at mitigating the impact of economic downturns for those aged around 45-49 may contribute to better health and functioning in later life.

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CONFLICTS OF INTEREST

None declared.

Key Points

- This paper assesses whether exposure to macroeconomic shocks during early and late mid-adulthood has long-lasting effects on physical health using a representative sample of individuals aged 55-80 in 11 European countries.
- We show that economic downturns around ages 45-49 negatively affect prevalence and incidence of functional limitations at later-life (ages 55-80).
- Effects of downturns around these ages on health-related behaviours and incomes may explain the long-lasting negative effects of downturns on health.
- Our findings stress the importance of adopting a life-course perspective to understanding how macroeconomic conditions shape health in later life.

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Figure

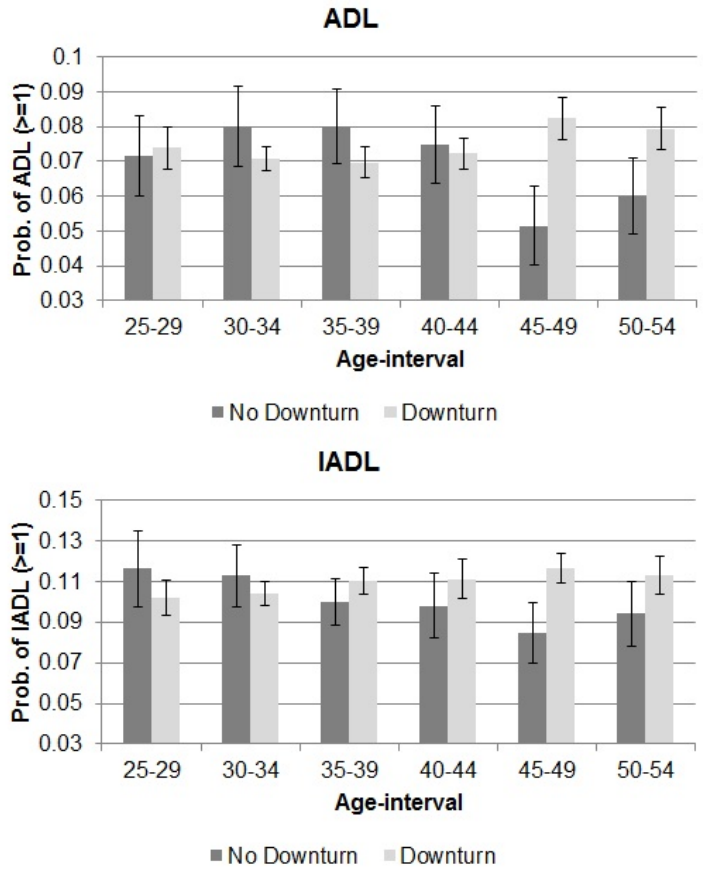


Figure 1. Downturns at ages 25-54 and probability of reporting functional limitations at ages 55-80 in 11 Western European countries

Abbreviations: ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living.

Notes: The Figure shows the predicted probabilities and associated 95% confidence intervals of reporting one or more limitations in ADL or IADL at ages 55-80 according to whether an individual experienced a downturn during consecutive 5-year age-intervals at 25-54 or not. Predicted probabilities were obtained from logistic regression models including fixed-effects for year and country of birth (using Austria as reference) as well as controls for age and sex.

Table 1. Logistic regression: Downturns at Ages 25-54 and prevalence of functional limitations at ages 55-80 in 11 Western European countries[a]

	ADL (>=1)			IADL (>=1)		
	OR	**CI**	**P**	**OR**	**CI**	**P**
Male	0.88	(0.69-1.13)	0.32	0.52	(0.33-0.81)	0.00
Age Spline (55-59)	1.27	(1.07-1.51)	0.01	1.11	(0.95-1.29)	0.20
Age Spline (60-69)	0.95	(0.86-1.05)	0.32	1.04	(0.87-1.24)	0.66
Age Spline (70-80)	0.99	(0.89-1.11)	0.93	1.05	(1.01-1.09)	0.03
Education (ref.: primary)						
Secondary education	0.56	(0.41-0.75)	0.00	0.57	(0.40-0.82)	0.00
Post-secondary education	0.40	(0.26-0.59)	0.00	0.42	(0.27-0.64)	0.00
Childhood physical injuries (yes)	1.46	(1.21-1.76)	0.00	1.20	(1.07-1.34)	0.00
Childhood infectious disease (yes)	0.81	(0.66-0.98)	0.03	0.87	(0.61-1.25)	0.46
ISCO (male breadwinner) [ref. blue collar]						
ISCO (male breadwinner) [white collar]	0.89	(0.61-1.31)	0.56	0.99	(0.86-1.13)	0.86
Features of childhood home (ref.: none)						
1-3	0.92	(0.76-1.10)	0.36	0.83	(0.67-1.02)	0.08
4-5	1.06	(0.67-1.66)	0.81	0.73	(0.49-1.08)	0.11
Downturn: by age-interval						
25-29	1.07	(0.79-1.45)	0.66	0.85	(0.63-1.15)	0.30
30-34	0.90	(0.70-1.15)	0.39	0.91	(0.72-1.14)	0.41
35-39	0.89	(0.71-1.12)	0.32	1.13	(0.91-1.39)	0.26
40-44	1.06	(0.82-1.38)	0.64	1.17	(0.86-1.57)	0.32
45-49	1.66	(1.24-2.22)	0.00	1.46	(1.10-1.94)	0.01
50-54	1.29	(0.99-1.67)	0.06	1.25	(0.92-1.69)	0.16

ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living; OR, odds ratio; CI, 95% confidence interval; P, p-value.

[a] The table shows the results of logistic regression models, regressing a binary indicator of having one or more limitations in ADL or IADL at ages 55-80 on a set of variables indicating the occurrence of a downturn during consecutive 5-year age-intervals between ages 25-54, controlling for a number of individual-level characteristics. The models also include fixed-effects for the country as well as year of birth. Standard errors are clustered on the country of birth level.

Table 2. Logistic regression: Downturns at Ages 25-54 and incidence of functional limitations at ages 55-80 in 11 Western European countries[a]

	ADL (Increase)			IADL (Increase)		
Downturn: by age-interval	**OR**	**CI**	**P**	**OR**	**CI**	**P**
25-29	1.46	(1.17-1.83)	0.00	1.21	(0.99-1.49)	0.07
30-34	1.03	(0.82-1.30)	0.77	0.94	(0.80-1.10)	0.43
35-39	1.36	(0.97-1.89)	0.07	1.19	(0.98-1.43)	0.07
40-44	1.34	(0.90-1.99)	0.15	1.20	(1.03-1.40)	0.02
45-49	1.01	(0.76-1.35)	0.93	1.44	(1.10-1.88)	0.01
50-54	1.09	(0.54-2.23)	0.81	0.97	(0.72-1.30)	0.83

ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living; OR, odds ratio; CI, 95% confidence interval; P, p-value.

[a] The table shows the results of logistic regression models, regressing a binary indicator capturing whether an individual experienced an increase in the number of limitations in ADL or IADL between wave 1 and 2 on a set of variables indicating the occurrence of a downturn during consecutive 5-year age-intervals between 25-54, controlling for a number of individual-level characteristics (same as Table 2). The models also include fixed-effects for the country as well as year of birth. Models are adjusted for baseline number of limitations as well as the months between baseline assessment and follow-up. Individuals with the maximum number of limitations in either ADL or IADL were excluded. Standard errors are clustered on the country of birth level. Models only include individuals which were interviewed in wave 1 and 2 (N=9,399).

Table 3. Logistic regression: Downturns at ages 25-54 and health behaviours and socioeconomic outcomes at ages 55-80 in 11 Western European countries[a]

Panel A

	Current Smoking			Physical Inactivity			Excessive Alcohol Consumption		
Downturn: by age-interval	OR	CI	P	OR	CI	P	OR	CI	P
25-29	0.89	(0.75-1.05)	0.18	0.94	(0.69-1.29)	0.72	0.92	(0.80-1.06)	0.26
30-34	0.92	(0.77-1.09)	0.34	1.11	(0.84-1.47)	0.46	0.91	(0.67-1.23)	0.53
35-39	0.96	(0.81-1.13)	0.59	1.01	(0.84-1.22)	0.90	1.09	(0.92-1.29)	0.34
40-44	0.85	(0.70-1.03)	0.10	0.92	(0.76-1.11)	0.37	1.25	(1.04-1.49)	0.02
45-49	1.21	(1.06-1.38)	0.00	1.11	(0.93-1.33)	0.26	1.25	(1.06-1.49)	0.01
50-54	0.94	(0.78-1.13)	0.50	0.77	(0.66-0.90)	0.00	0.86	(0.77-0.97)	0.01

Panel B

	Income Quartiles[b]			Retired vs. Working[c]			Health limits ability to work until regular retirement[d]		
Downturn: by age-interval	OR	CI	P	OR	CI	P	OR	CI	P
25-29	0.96	(0.89-1.02)	0.20	0.93	(0.74-1.18)	0.57	0.71	(0.43-1.16)	0.17
30-34	1.06	(0.91-1.23)	0.47	0.99	(0.58-1.71)	0.98	0.48	(0.27-0.85)	0.01
35-39	1.00	(0.90-1.10)	0.94	1.20	(0.86-1.67)	0.29	0.63	(0.45-0.87)	0.01
40-44	0.98	(0.86-1.11)	0.70	0.95	(0.79-1.14)	0.57	1.08	(0.91-1.29)	0.38
45-49	0.94	(0.88-1.00)	0.04	1.24	(0.81-1.89)	0.32	1.81	(1.13-2.90)	0.01
50-54	0.92	(0.83-1.03)	0.16	1.61	(1.13-2.28)	0.01	1.33	(0.96-1.83)	0.09

OR, odds ratio; CI, 95% confidence interval; P, p-value.

[a] All models include the same covariates as in Table 2.

[b] Ordered logistic model. A higher quartile indicates higher incomes.

[c] Retired vs. working is a binary indicator referring to the current economic activity. Individuals working part- or full-time and those reporting to be looking for a job were classified as working. Excluded are individuals who are who are homemakers, permanently sick or others (student, doing voluntary work or living off own property).

[d] Binary indicator (no/yes) based on the question "Are you afraid that your health will limit your ability to work in this job before regular retirement?" Since this question was only asked to individuals currently working, the model for this outcome only includes this group.

Appendix

Appendix Table 1: Minimum Deviation in Long-Term trend in GDP per Capita in Years Defined as Downturn[a]

Country	Deviation
Austria	-0.055
Belgium	-0.025
Denmark	-0.016
France	-0.022
Germany	-0.025
Greece	-0.105
Italy	-0.021
Netherlands	-0.080
Spain	-0.043
Sweden	-0.032
Switzerland	-0.029

[a] The Table shows the minimum value of deviations in the long-term trend in GDP per capita, derived by using the Hodrick-Prescott filter, to be classified as downturn.

Appendix Table 2. Sample description[a]

Variable	n	%	Variable	n	%
ADL			Downturn (yes) by age-interval		
0	12,634	93.49	25-29	8,532	63.13
1	588	4.35	30-34	8,435	62.42
2	187	1.38	35-39	9,100	67.34
3	60	0.44	40-44	8,658	64.07
4	32	0.24	45-49	9,955	73.66
5	13	0.10	50-54	9,158	67.77
IADL			Current Smoking (yes)	2,421	17.91
0	12,005	88.83	Physically Inactive (yes)[d]	809	5.99
1	1,079	7.98	Excessive alcohol consumption (yes)[e]	1,537	13.86
2	263	1.95			
3	106	0.78	Income Quartiles (country-specific)[f]		
4	36	0.27	1	3,027	23.17
5	15	0.11	2	3,255	24.92
6	10	0.07	3	3,351	25.65
ADL increase (since baseline)	901	6.90	4	3,431	26.26
IADL increase (since baseline)	1,224	9.37	Retired vs. Working[g]	3,340	31.27
Male	6,313	46.71	Health limits ability to work until regular retirement[h]	748	24.48
Age Spline (55-59)	3007	22.25	Country of birth		
Age Spline (60-69)	6014	44.52	Austria	491	3.63
Age Spline (70-80)	4493	33.25	Belgium	1,734	12.83
Education (primary)	4,577	33.87	Denmark	1,259	9.32
Education (secondary)	5,955	44.07	France	1,266	9.37
Education (post-secondary)	2,982	22.07	Germany	1,101	8.15
Childhood physical injuries (yes)	3,248	24.03	Greece	1,567	11.60
Childhood infectious disease (yes)	11,379	84.20	Italy	1,642	12.15
ISCO male breadwinner (blue collar)[b]	10,036	74.26	Netherlands	1,312	9.71
ISCO male breadwinner (white collar)	3,478	25.74	Spain	1,187	8.78

Features of childhood home (none)[c]	3,799	28.11	Sweden	1,216	9.00
Features of childhood home (1-3)	6,925	51.24	Switzerland	739	5.47
Features of childhood home (4-5)	2,790	20.65			

ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living; ISCO, International Standard Classification of Occupations.

[a] Own calculations based on SHARE wave 1 and 2 as well as SHARELIFE. Information in recessions at ages 25-54 was derived from Maddison (2006). Means are unweighted. N=13,514.

[b] Blue collar-worker include skilled agricultural and fishery workers, craft and related trades workers, plant and machine operators and assemblers, elementary occupations and members of the armed forces; and white collar-worker include legislators, senior officials and managers, professionals, technicians and associate professionals, clerks or service workers and shop and market sales workers).

[c] Features of home include: fixed bath, cold running water supply, hot running water supply, inside toilet and central heating.

[d] Hardly ever or never engaging in vigorous physical activity

[e] Drinking alcohol almost every or 5/6 days a week.

[f] Income quartiles are country-specific and adjusted by purchasing power parities (PPP) as well as household size.

[g] Retired vs. working is a binary indicator referring to the current economic activity. Individuals working part- or full-time and those reporting to be looking for a job were classified as working. Excluded are individuals who are homemakers, permanently sick or others (student, doing voluntary work or living off own property).

[h] Binary indicator (no/yes) based on the question "Are you afraid that your health will limit your ability to work in this job before regular retirement?" As this question was only asked to individuals currently working, the model for this outcome only includes this group.

Appendix Table 3. Logistic regression: Downturns at Ages 25-54 and Likelihood of Smoking Cessation in 11 Western European countries[a]

	Smoking cessation at ages 26-40			Smoking cessation at ages 41-55		
	OR	**CI**	**P**	**OR**	**CI**	**P**
Downturn: by age-interval						
25-29	1.06	(0.86-1.31)	0.56			
30-34	1.03	(0.80-1.32)	0.84			
35-39	1.27	(0.86-1.89)	0.23			
40-44				0.83	(0.71-0.97)	0.02
45-49				0.88	(0.77-1.01)	0.07
50-54				0.73	(0.61-0.86)	0.00

OR, odds ratio; CI, 95% confidence interval; P,p-value.

[a] The models assess the association between downturns at subsequent age intervals and the likelihood of quitting smoking during the respective age-intervals among smoker. All models include the same covariates as in Table 2.

Appendix Table 4. Logistic regression: Downturns at Ages 25-54 and prevalence of functional limitations at ages 55-64 in 11 Western European countries[a]

	ADL (>=1)			IADL (>=1)		
Downturn: by age-interval	**OR**	**CI**	**P**	**OR**	**CI**	**P**
25-29	1.17	(0.72-1.90)	0.52	0.74	(0.44-1.24)	0.26
30-34	0.79	(0.49-1.27)	0.33	0.84	(0.56-1.27)	0.41
35-39	0.86	(0.57-1.30)	0.48	0.80	(0.55-1.17)	0.25
40-44	1.16	(0.82-1.65)	0.41	1.75	(0.91-3.34)	0.09
45-49	2.20	(1.41-3.42)	0.00	1.33	(1.11-1.59)	0.00
50-54	0.81	(0.57-1.14)	0.22	1.33	(1.14-1.55)	0.00

ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living; OR, odds ratio; CI, 95% confidence interval; P,p-value.

[a] Models include the same covariates as in Table 2.

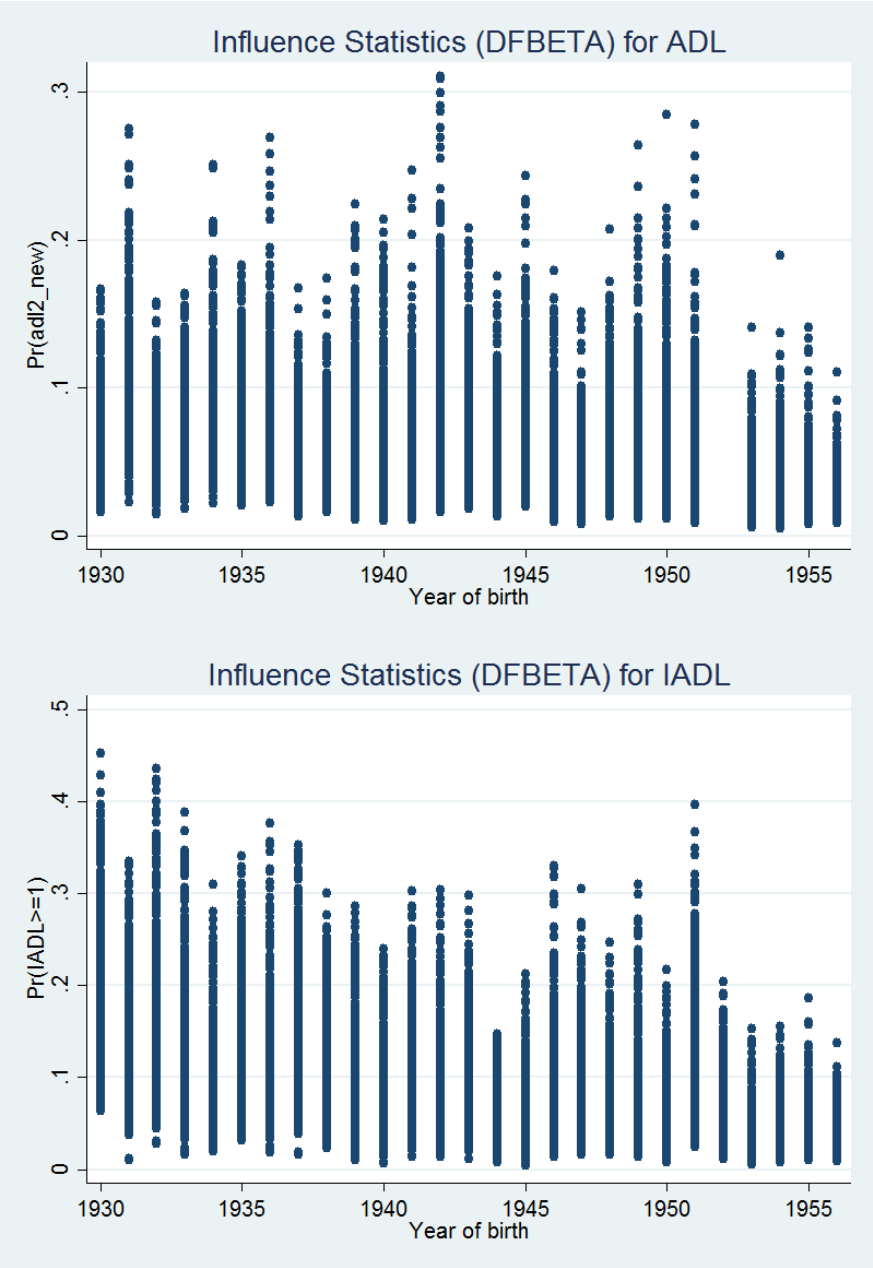
Appendix Table 5: Logistic regression: Downturns at Ages 25-54 and Risks of Functional Limitations at Ages 55-80[a]

	ADL (>=1)			IADL (>=1)		
	OR	**CI**	**P**	**OR**	**CI**	**P**
Original results: Using waves 1, 2 and 3 (as in Table 2)						
Downturn: Age-interval						
25-29	1.07	(0.79-1.45)	0.66	0.85	(0.63-1.15)	0.30
30-34	0.90	(0.70-1.15)	0.39	0.91	(0.72-1.14)	0.41
35-39	0.89	(0.71-1.12)	0.32	1.13	(0.91-1.39)	0.26
40-44	1.06	(0.82-1.38)	0.64	1.17	(0.86-1.57)	0.32
45-49	1.66	(1.24-2.22)	0.00	1.46	(1.10-1.94)	0.01
50-54	1.29	(0.99-1.67)	0.06	1.25	(0.92-1.69)	0.16
Alternative results: Using waves 1, 2, 3 and 4						
Downturn: Age-interval						
25-29	0.98	(0.91-1.06)	0.61	0.87	(0.79-0.97)	0.01
30-34	1.06	(0.95-1.17)	0.28	1.04	(0.93-1.16)	0.50
35-39	1.04	(0.96-1.13)	0.34	1.05	(0.97-1.14)	0.23
40-44	1.04	(0.96-1.13)	0.34	1.06	(1.00-1.12)	0.04
45-49	1.12	(1.01-1.25)	0.04	1.11	(1.03-1.21)	0.01
50-54	1.08	(0.99-1.17)	0.07	1.10	(1.02-1.18)	0.02

ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living; OR, odds ratio; CI, 95% confidence interval; P,p-value.

[a] To assess the robustness of the results to potential cohort-effects, the above Table compares the results using SHARE waves 1, 2 and 3 (as presented in Table 2) with an analysis that includes individuals first interviewed in wave 4 (N=63,860). Because we lack retrospective information on childhood health and socioeconomic conditions, as those were only collected in wave 3, models including the wave 4 sample only include controls for age, sex, education and fixed-effects for country and year of birth.

Appendix Figure 1: Influence Statistics (DFBETA) by Year of Birth for ADL and IADL[a]



[a] To empirically investigate if the results are potentially driven by particular cohorts, we conducted a set of sensitivity analyses. More specifically, we estimated influence statistics following the main models presented in Table 2. The two graphs show the influence of single observations (using the Stata post-estimation command 'DFBETA' which "…measures how much impact each observation has on a particular predictor. The DFBETA for a predictor and for a particular observation is the difference between the regression coefficient calculated for all of the data and the regression coefficient calculated with the observation deleted, scaled by the standard error calculated with the observation deleted." [see: http://www.reed.edu/psychology/stata/analyses/parametric/Regression/pe/dfbeta.html]. As the respective plot for the model using ADL as the outcome suggests, the influence of individual observations is distributed rather equally across cohorts. Only some

observations around the year of births 1931, 1936, 1942 and 1949-1951 seem to stand out by lying above the line 0.2. However, the number of observations above this line is very small (n=250) and omitting them from the models does not change the results to a noteworthy degree. When looking at the influence statistics for IADL it seem that earlier cohorts (years of birth around 19301935) have a larger influence on the results than later cohorts. However, excluding observations with values above 0.3 (n= 562) or 0.25 (n=925) does not alter results to a noteworthy degree.

Appendix Table 6. Logistic regression: Downturns at Ages 25-54 and Risks of Functional Limitations at Ages 55-80, Controlling for Non-Employment and Job-Loss[a]

	ADL (>=1)			IADL (>=1)		
	OR	**CI**	**P**	**OR**	**CI**	**P**
Controlling for experiences of non-employment						
Downturn: Age-interval						
25-29	1.18	(0.89-1.56)	0.26	0.88	(0.59-1.29)	0.50
30-34	0.82	(0.62-1.10)	0.19	0.92	(0.65-1.32)	0.66
35-39	0.92	(0.72-1.19)	0.53	1.04	(0.82-1.33)	0.74
40-44	1.10	(0.84-1.44)	0.49	1.24	(0.88-1.75)	0.22
45-49	1.72	(1.16-2.55)	0.01	1.52	(0.99-2.34)	0.06
50-54	1.14	(0.90-1.44)	0.27	1.30	(0.82-2.06)	0.27
Non-Employed: Age-interval						
25-29	0.75	(0.53-1.06)	0.10	0.91	(0.75-1.11)	0.36
30-34	1.25	(0.96-1.63)	0.09	0.91	(0.66-1.25)	0.55
35-39	0.85	(0.56-1.31)	0.47	0.8	(0.47-1.35)	0.41
40-44	0.70	(0.27-1.82)	0.47	1.06	(0.75-1.50)	0.75
45-49	1.32	(0.94-1.85)	0.11	0.98	(0.62-1.54)	0.92
50-54	1.38	(0.76-2.50)	0.29	1.28	(0.84-1.96)	0.26

Table continued on next page.

	ADL (>=1)			IADL (>=1)		
	OR	**CI**	**P**	**OR**	**CI**	**P**
Controlling for experiences of job-loss or plant-closure						
Downturn: Age-interval						
25-29	1.17	(0.88-1.55)	0.28	0.88	(0.59-1.29)	0.50
30-34	0.83	(0.63-1.09)	0.19	0.93	(0.65-1.33)	0.68
35-39	0.94	(0.72-1.22)	0.62	1.05	(0.82-1.35)	0.71
40-44	1.08	(0.84-1.40)	0.54	1.23	(0.87-1.75)	0.24
45-49	1.71	(1.16-2.53)	0.01	1.51	(0.98-2.31)	0.06
50-54	1.12	(0.90-1.39)	0.30	1.30	(0.83-2.01)	0.25
Laid-off/Plant closure: Age-interval						
25-29	0.43	(0.13-1.41)	0.17	1.01	(0.51-2.01)	0.97
30-34	1.32	(0.40-4.36)	0.65	0.87	(0.48-1.55)	0.63
35-39	0.31	(0.05-1.85)	0.20	0.7	(0.15-3.37)	0.66
40-44	1.79	(0.91-3.52)	0.09	2.05	(0.99-4.24)	0.05
45-49	0.72	(0.44-1.19)	0.20	1.12	(0.64-1.99)	0.69
50-54	1.66	(1.01-2.74)	0.05	1.02	(0.65-1.61)	0.93

ADL, Activities of Daily Living; IADL, Instrumental Activities of Daily Living; OR, odds ratio; CI, 95% confidence interval; P,p-value.

[a] The Table shows the results of logistic regression models, regressing a binary indicator of having one or more limitations in ADL or IADL at ages 55-80 on a set of variables indicating the occurrence of a downturn during consecutive 5-year age-intervals between 25-54, controlling for lay-offs or unemployment because of plant closure (defined as experiencing at least one spell in each respective age-bracket). The models have the same covariates, including fixed-effects for the country as and year of birth, as those presented in Table 2. Standard errors are clustered on the country of birth level. Due to missing information on work-histories, the sample size (N=11,108) is smaller than that used for the main sample (N=13,514).